

# FILM-TECH

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TR4/R4 SOUND REPRODUCERS

REVERSE SCANNING

OPERATION AND ADJUSTMENT

GENERAL

Unlike any sound reproducer now used for professional motion picture presentations, the Century TR4/R4 series optical sound reproducers require practically no critical adjustments to obtain the finest sound reproduction ever.

The TR4/R4 reproducers use a method of rear scanning the sound track. This means the light goes through the film in the reverse direction (from front to rear (refer to the diagrammatic illustration of reverse scanning in the Century TR4 sound reproducer on page 4 of this release).

Actually this method should be called front scanning because the front of the sound track (emulsion side) is scanned. With front scanning, the sound track is accurately focused onto a physical slit, thereby eliminating all cross reflections, focus failures, diffusion, etc., inherent in the older models.

The mechanical changes of the TR4/R4 from the older Century models TR3, R3 and R5 are deceptively simple. The changes consist essentially of mounting the exciter lamp where the photoelectric cell was, a relay lens in place of the anapfet, the objective lens in place of the lens tube and the photo-verter installed in the rear of the reproducer that formerly housed the exciter lamp.

The photo-verter should be thoroughly understood. It consists of a narrow physical slit directly in front of a silicone photosensitive cell (solar cell), which is directly coupled to a solid state amplifier. The photo-verter is a modular construction and permanently assembled and connected as a complete operating unit. The output level is high enough to operate most power amplifiers without additional amplification.

As adjusted at the factory, the photo-verter is exactly interchangeable in the reproducer without further adjustments. It has a locating slot fitting over a locating pin so the azimuth of the slit will be correct.

OPERATION AND ADJUSTMENT (Century All-Transistor Sound Systems)

The rear scanning system includes the following assemblies and parts (refer to illustrated/photograph - final page of this release)

- R4-40            Exciter Lamp Assembly (LP-84 Exciter Lamp)
- R4-140         Relay Lens and Bracket Assembly
- R4-280         Photo-verter and Leads
- W3-60          Sound Pickup Terminal Strip Assembly
- TU-254         Objective Lens

R4-40 EXCITER LAMP ASSEMBLY AND EXCITER LAMP (LP-84)

A new long-life exciter lamp (estimated 10,000 hours) (LP-84) supplies the illumination for the sound reproduction. This is a new design and is not interchangeable with the older types. This lamp is especially designed to operate

OPERATION AND ADJUSTMENT (CONTINUED)

with the relay lens (R4-140) to give an even illumination across the whole sound track. This is an essential design feature especially needed with certain types of sound using "push-pull" tracks. It also anticipates the possible use of optical sound tracks for stereophonic sound reproduction.

The LP-84 lamp has a prefocus base so that it is interchangeable without refocusing.

The exciter lamp socket is mounted on the exciter lamp mounting plate assembly. This mounting plate is of a modern anti-vibration material to reduce any adverse effect of machine vibration.

R4-140 RELAY LENS AND BRACKET ASSEMBLY

The relay lens operation is unique because it does not "focus" a spot of light onto the film. The light image is diffused and considerably larger than the sound track. Because of this design, the illumination system is not critical and may be "adjusted" within wide limits without affecting the quality of sound reproduction. This feature will be welcomed by those accustomed to the usual adjustment problems with the older exciter lamps.

ADJUSTMENTS

Place a 9 KC film (it can be a loop) in the projector and sound reproducer with the exciter lamp on.

Adjust the position of the relay lens to give a rectangular spot of light of about 1/8 inch high on the film. The spot of light can be centered on the sound track vertically by moving the R4-40 up or down in the slots provided. The spot of light is much wider than the sound track because of the diffusion, which assures over-all illumination even if the spot is not exactly centered horizontally.

The relay lens mounting is designed to be slightly eccentric so that the beam position may be moved within limits by rotating the lens.

TU-254 OBJECTIVE LENS AND THE R4-280 PHOTO-VERTER

With the 9 KC loop still in position, the TU-254, objective lens may be focused to give a sharp image of the track onto the face of the photo-verter. This focus can be made by eye. The 9 KC track may be difficult to see without a magnifying glass.

A white card may be held against the front of the photo-verter for a clearer image. It may also be expedient to use a lower frequency film of 1 KC. A sharp focus may also be determined by focusing the grain of the film onto the face of the photo-verter (black and white film).

By adjusting the exciter lamp and the relay lens, the image of the sound track will be in proper place on the slit of the photo-verter and evenly illuminated.

Observing the position (azimuth) of the photo-verter with respect to the striations of the sound track (Western Electric variable density recording) a very close visual azimuth alignment can be obtained.

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### FINAL AZIMUTH ADJUSTMENT

Connect a meter to the output of the JRA-113 preamp (Century transistor sound system) or directly across the terminals of the photo-verter on the W3-60 terminal strip assembly.

Run the 9 KC loop of film.

If necessary, refocus the objective lens and reset the azimuth of the photo-verter. This may be done by loosening the set screw in the side of the photo-verter and rotating the barrel containing the slit until maximum readings are obtained on the meter.

As the rotation of the photo-verter and the focus of the objective lens are independent, they can be adjusted separately to arrive at the optimum output level on the meter.

Lock the barrel of the photo-verter with the small set screw.

The azimuth adjustment of the R4-280 is done at the factory and normally will not require readjustment in the theater. As all photo-verters are adjusted to a standard and are located by a pin when installed, they can usually be changed in the theater without further adjustment.

Rotating the objective lens (TU-254) will not change the azimuth adjustment or focus, but some slight shift of the entire image may be expected.

### BUZZ TRACK ADJUSTMENT

Place a buzz track in the sound reproducer and with the projector running, set the side guide roller, as is customary, for minimum readings on the meter.

### SNAKE TRACK TEST

With the snake track spliced for a normal .087" total movement from side to side, run the film in the projector through the sound reproducer and read the output on the meter as above. Variations of plus or minus 2 DB is normal. If readings greater than this are recorded, the line-up of illumination adjustments should be rechecked.

It should be noted that the output level of the snake track is somewhat distorted and about 18 DB down in level from the 1 KC output of the balancing test loop.

### 1 KC BALANCING LOOP

Run the 1 KC balancing test loop through the reproducer.

The output at the photo-verter should be 0.4 volts plus or minus 3 DB with 117 line voltage and a Century exciter lamp power supply (JRA-115).

Adjust the system gain and the trimmer pots for 0.35 volts output of the JRA-113 preamplifiers in the optical mode of the multiple channel systems and the JTR single channel systems.

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The complete Century sound system is now in adjustment and ready for operation. The following tests may be made if test equipment is available.

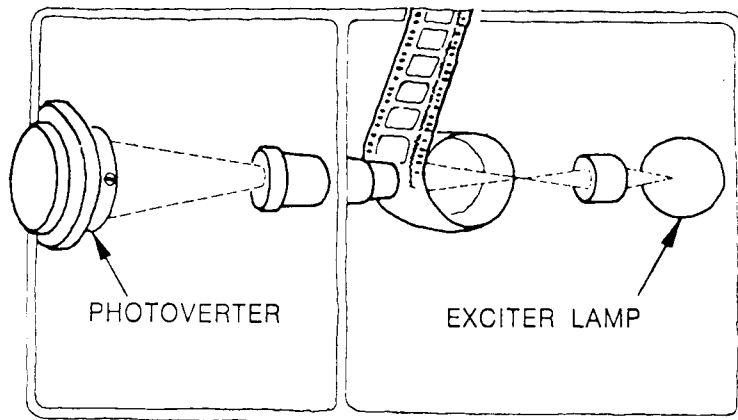
NOISE READING

With the exciter lamp turned off or the light cut off from the photo-verter, the signal to noise ratio should be approximately 60 DB or 54 DB below a 50% modulated 1 KC test loop.

HIGH FREQUENCY OUTPUT

With an 8 KC test loop, and applying normal corrections, the output should be normally 4 to 6 DB from a similarly corrected 1 KC reference level.

Suppose a reading of minus 6 DB is being read at 8 KC. The motor power can be switched off. This will allow the projector to slow down. The reading on the meter will gradually increase to show a higher output to about 2 DB less than the 1 KC track. This is the residual slit loss at 8 KC.



DIAGRAMMATIC ILLUSTRATION OF REVERSE SCANNING IN THE CENTURY TR4 SOUND REPRODUCER---

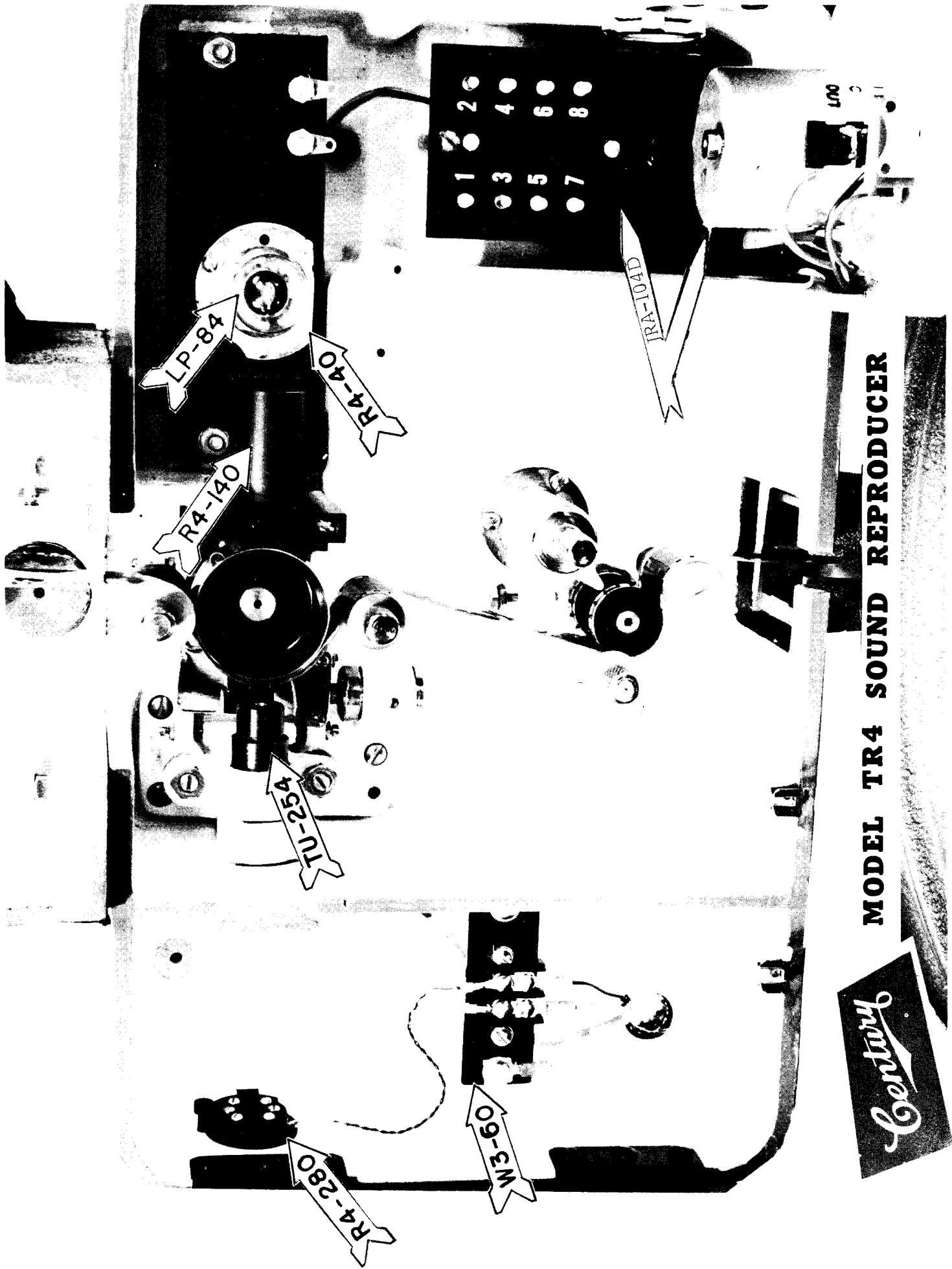
# Listen to the pure sound of "Reverse Scanning"

RELEASE #393  
AUGUST 1970

WITH SOLID STATE PICKUP



**CENTURY PROJECTOR CORPORATION**  
165 West 46th Street, New York, N. Y. 10036



**MODEL TR4 SOUND REPRODUCER**





## INSTALLATION AND OPERATING

### CENTURY SOUND SYSTEMS TRANSISTORIZED - OPTICAL JTR-101-2 SERIES (FOR 2-35MM PROJECTORS)

GENERAL (COMPONENTS OF THE JTR-0-101-2 BASIC SYSTEM)  
READ THESE INSTRUCTIONS CAREFULLY BEFORE STARTING YOUR INSTALLATION

2 - TR3-(MTR3)	Sound reproducers with motors and drives.
2 - JRA-101-D	ANAPFET assembly (mounts in sound reproducers).
2 - JRA-104-D	Projector volume control with trimmer gain control, terminal panel and changeover button (in sound reproducers).
3 - JRA-113	Preamplifiers (one for non-sync) (in JRA-119).
2 - JRA-115	D.C. exciter lamp power supply (mounts in JRA-119).
1 - JRB-117	Power amplifier and power supply (mounts in JRA-119).
1 - JRA-119	System cabinet and junction station for wall mounting.
1 - JRA-133	Changeover amplifier (mounts in JRA-119).
1 - W5-40A	Monitor speaker with transistor amplifier and volume control in cabinet (wall mounted).

\*NOTE: The JRE-100 can be used in place of the JRB-117 without the need for any changes and will provide more than 35 watts of continuous audio power.

#### PROJECTOR UNITS

One JRA-101D ANAPFET assembly and one JRA-104D volume control and changeover button are mounted in each sound reproducer. About .35 volts are developed at the output of the ANAPFET pickup with a fully modulated variable area track. The necessary biasing resistors and balancing pot are located in the rear of the terminal panel, with a 10K variable trim resistor connecting the ANAPFET pickup output to the 10K volume control potentiometer.

The output of the volume control is then fed through coaxial cable to junction box, JRA-119.

Level of this signal is approximately .015 volts at the variable impedance depending on fader setting. This system does not require special low capacity coaxial cable.

#### JRA-119 SYSTEM CABINET AND JUNCTION STATION

Mounts away from the wall with brackets provided to allow ample air circulation for amplifiers and power supplies. Non-sync volume control is operable through the cover. A phone jack is provided for critical monitoring of the power amplifier output. A detachable chassis contains the master terminal panel, sockets for the plug-in units and all internal wiring. For grounding the system from a cold water pipe a "GND" lug is provided. CAUTION ground system only at this point. Refer to drawing E-1797-8 for dimensions of the JRA-119.

APRIL 1970



PAGE 1 OF 5  
+ DRAWINGS

JRA-114 SYSTEM POWER SUPPLY

Supplies 15 volts, D.C., for the preamplifiers when an external high gain power amplifier is used. The JRA-114 power supply mounts in the JRA-119 junction cabinet in place of the JRB-117 or JRE-100 amplifier.

JRA-115 D.C. EXCITER LAMP POWER SUPPLY

Output 4 volts, D.C. at 3 amps. for use with 4 amp. exciter lamps (LP-15). This supply is designed, in conjunction with 4 ampere lamp and the rising infra-red response of the ANAPFET, to be partially self-regulating with normal line voltage variations. The JRA-115 mounts in the JRA-119 junction cabinet.

POWER AMPLIFIER WITH POWER SUPPLY

JRB-117 Amplifier is a transformer-less transistor power amplifier with damping factor optimised for use with theatre backstage speakers. Overload protection is incorporated and no damage will be caused by 30 DB over maximum surges. Distortion characteristic is extremely smooth and is not subjected to the long-recovery effects of overload which is typical of some vacuum tube amplifiers. This unit incorporates high and low frequency adjustment provisions to compensate for auditorium acoustic conditions (Reference Drawing EL-1717). A volume control is also included for adjustment of auditorium sound balance (overall theatre volume is adjusted through the master control at each projector).

This amplifier will deliver 10 watts continuously (mounted in the JRA-119 cabinet). Input impedance, 600 ohms at 1KC.

The internal power supply provides 40 volts D.C. for the power amplifier and 15 volts for the pre-amplifiers and ANAPFETS.

The JRB-117 mounts in the JRA-119 cabinet.

JRE-100 AMPLIFIER - is a 35 watt power amplifier used in place of JRB-117 for increased power. This unit incorporates high and low frequency adjustment provisions to compensate for auditorium acoustic conditions (Reference Drawing EL-1716). A volume control is also included for adjustment of auditorium sound balance (overall theatre volume is adjusted through the master control at each projector).

This amplifier will deliver 35 watts continuously (mounted in the JRA-119 cabinet). The internal power supply provides 40 volts D.C. for power amplifier and 15 volts for preamplifiers and ANAPFETS. Impedance 50K ohms at 1KC.

CAUTION: SUSTAINED HIGH POWER, HIGH FREQUENCY TESTS SHOULD BE STRICTLY AVOIDED TO LIMIT HEAT RISE ON THE POWER TRANSISTORS. Program material has insufficient high frequency power to cause significant heat rise. NOTE: JRA-114, 115, JRB-117 and JRE-100 have plug and socket connections arranged so that damage is impossible should any unit be inserted accidentally in the wrong socket.

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JRA-113 PREAMPLIFIERS AND JRA-133 CHANGEOVER AMPLIFIER

Three JRA-113 preamplifiers are used, two for the optical sound track amplification and one for music or microphone. The JRA-113 is a 3-stage low noise amplifier with low impedance output (200 ohms) and high impedance input.

An input of .015 volts gives an output of .7 volts. The amplifier is designed for noiseless audio switching by application of 15 volts D.C. to the control circuit. This 15 volts is derived from the changeover amplifier (JRA-133) - the electronic equivalent of a mechanical latching relay. A momentary operation of the changeover button on one projector switches ON JRA-133 and the JRA-113 (audio) amplifier connected to that particular projector and holds it ON until another projector button is pushed. NOTE: At the beginning of a show, it may be found more convenient to set the fader on the projector to minimum, press changeover button and increase to normal fader setting when up to speed. At the end of the last reel, rather than press a "dead" projector button, gradually decrease the finishing projector volume control setting to minimum.

The non-sync JRA-113 amplifier is not switched, but bridges into the power amplifier input. This avoids any possible interruption of the main film channel but allows fading in and out of music and also voice paging while the show is running. It is recommended using record player with dynamic pick-up or dynamic microphone (reference drawing EL-1523D). Three JRA-113 and one JRA-133 mount in the JRA-119 junction cabinet.

W5-40A MONITOR SPEAKER/TRANSISTOR AMPLIFIER WITH VOLUME CONTROL IN CABINET

The W5-40A is a monitor speaker (SJ-630) with transistor amplifier and volume control (JRB-122) in a wall mounted cabinet and permits continuous monitoring of the program material. The JRB-122 is a single channel monitor amplifier for optical sound only. The dimensions of the wall mounted cabinet is 12"x12"x7".

FUSE SIZES FOR ALL TRANSISTOR UNITS

JRE-100	2 Ampere - 3AG	Regular
JRA-114	1 Ampere - 3AG	Slo-Blo
JRA-115	1 Ampere - 3AG	Slo-Blo
JRB-117	1 Ampere - 3AG	Regular
JRB-122	3/16 Ampere - 3AG	Slo Blo



**ALL-TRANSISTOR SOUND SYSTEMS**

SINGLE CHANNEL • FOUR CHANNEL • SIX CHANNEL

*a significant achievement in modern electronics!*

APRIL 1970

ANAPFET photosensitive, field-effect transistor—now the heart of all Century transistor sound systems—unparalleled optical sound pick-up from single and multi-channel sound tracks.

MULTI-CHANNEL SOUND SYSTEMS — all-transistor — low noise level—high quality—"permanent"—the choice of leading first-run theatre circuits.

**CENTURY PROJECTOR CORPORATION**

NEW YORK, N. Y. 10019

REFERENCE DRAWINGS (OPTICAL SOUND SYSTEMS)

EL-1519-B	Installation Wiring
EL-1520-B	Basic conduit layout
EL-1523-D	Block Schematic
EL-1524-D	JRA-119 Junction cabinet wiring
E-2046	JRB-122 monitor amplifier schematic
EL-1704A	JRE-100 power amplifier schematic
EL-1711	JRA-101-D and JRA-104-D schematic
EL-1716	System response curve with JRE-100
EL-1717	System response curve with JRB-117
E-1797-B	JRA-119 Junction cabinet dimensions & knockout locations
EB-1927-1	Sound system schematic
E-1950-A	JRB-117 power amplifier schematic

INSTALLATION PROCEDURE

Check plug-in unit locations per Drawing No. EL-1524-D  
Check installation wiring per Drawing No. EL-1519-B  
Check fuses in both JRA-115 exciter lamp power supplies and JRB-117 OR JRE-100 power amplifier (OR JRA-114 system power supply).  
Fuse sizes for all equipment units shown on page 3.

TURN VOLUME CONTROL ON POWER AMPLIFIER TO MINIMUM. Turn on power. Measure DC voltages per Drawing No. EL-1523-D. Thread projector #1 with standard multi-frequency test reel - using 1000 cycle portion or 1000 cycle loop. Set sound reproducer volume control at 14 (six steps below maximum). Connect VTVM to pin P-1 (HI) and Ground (LO) of JRA-119 terminal station.

Press changeover button on sound reproducer with projector running. The trimmer pot on the sound reproducer terminal panel of the JRA-104D is factory adjusted for 0.7 volts RMS reading on VTVM. Take readings of frequency response using multi-frequency test reel. Equipment is shipped without high frequency electrical attenuation so that the 8000 cycle reading should be down about 6 DB from the 1000 cycle reading, the result of normal slit loss. If reading is lower, check azimuth and focus.

With projector stopped, measure noise on VTVM (between P1 and B1 on the JRA-119 terminal station). Should not exceed .001 volts. Repeat for second projector.

Projectors are now operating normally and ready for auditorium tests. Set H.F. attenuation on backstage speakers. Run theatre test reel, speech and music. With both sound reproducer volume controls at a convenient setting - mid-range - adjust gain control on power amplifier for normal theatre listening level, (with JRB-117 power amplifier set at Step 6 or 7 for 600-800 seat theatres.)

NOTE: Unusual theatre acoustic conditions occasionally require departure from this established standard. When non-standard equalization is clearly called for, the audio characteristic can be altered by adjustment of the bass and treble controls on the JRB-117 or JRE-100.  
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ELECTRICAL INTERFERENCE IN JTR-0-101-2 SYSTEM

The system has very low inherent noise level but as electrical layouts in projector booths vary widely, situations may be met where electrical interference in any of the following categories is significant:

- a) 60 or 120 cy. hum - possible changing with electrical load, i.e., air conditioners, house lights, fluorescent lamp balasts, etc.
- b) "Frying" and higher frequency hum.
- c) Clicks when motors, arcs or other electrical equipment are switched.
- d) Radio pick-up.

If these effects are noticed, it is likely that the interference is entering the electronic system through the ground return from the projector phototransistor and control fader to the junction box.

The system is "case" grounded only at junction box using heavy gauge wire to connect to a reliable cold water pipe ground. Do not rely on ground wires used for other purposes. Additional grounds connected, for example, to the low side of the stage speaker line may reduce interference in unusual cases, but may cause a "loop" ground condition and should in general be avoided. (Century transistor sound systems are grounded on the positive side of the D.C.)

Interference may also enter the system through the A.C. feed to the JRA-119 junction box. It is important that this be fed direct from the main distribution panel. This should avoid "clicks" caused by surges from motors, etc., with very high starting currents. As the grounding point of the A.C. feed is variable, a polarity change for the JRA-119 feed may reduce power line interference. In extreme cases, standard power line filters in one or both sides of the A.C. feed may be necessary.

TROUBLE SHOOTING AND REPAIR

The plug-in components of the JTR-0-101-2 system can be repaired using standard test instruments and signal tracing procedure.

NOTES:

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APRIL 1970



DWG NO. EL-1519B

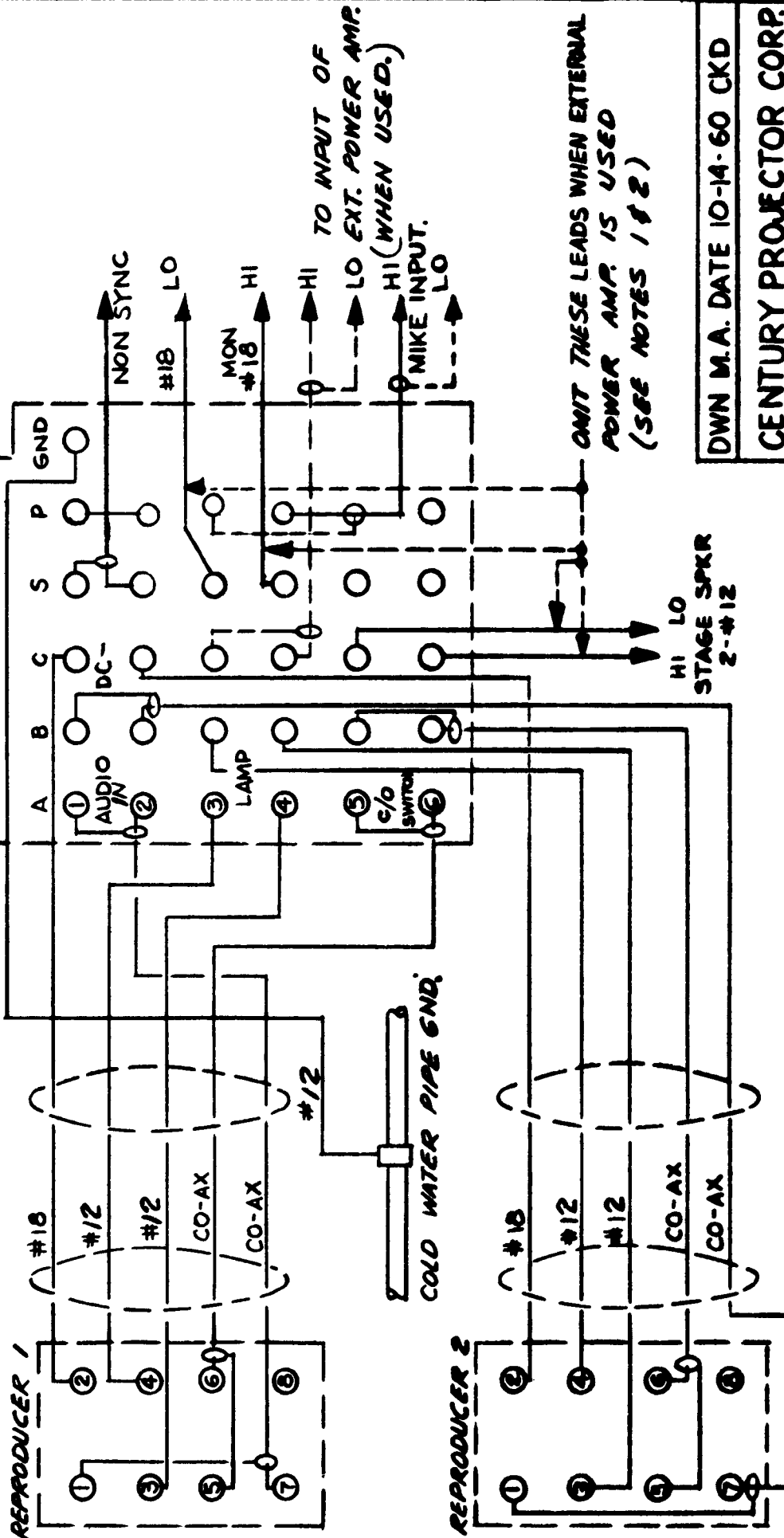
NOTES:

- 1. THIS TRANSISTOR SOUND SYSTEM GROUNDS ON POSITIVE SIDE
- 2. WHEN EXTERNAL POWER AMP IS USED, JRA 114 POWER SUPPLY REPLACES JRB-117 OR JRE-100

3. MONITOR AMP. IS CONNECTED TO OUTPUT OF EXT POWER AMP. (OBSERVE POLARITY)

PART NO. JTR-O-101-2			
NAME: OPTICAL SOUND SYSTEM			
INSTALLATION WIRING			
ISSUE LTR	REVISIONS	APP'D	DATE
A			5-18-67
B			1-2-70

JRA-119 TERMINAL BOARD  
(EXTERNAL CONNECTIONS)



DWN M.A. DATE 10-14-60 CKD
CENTURY PROJECTOR CORP.
NEW YORK, N.Y.

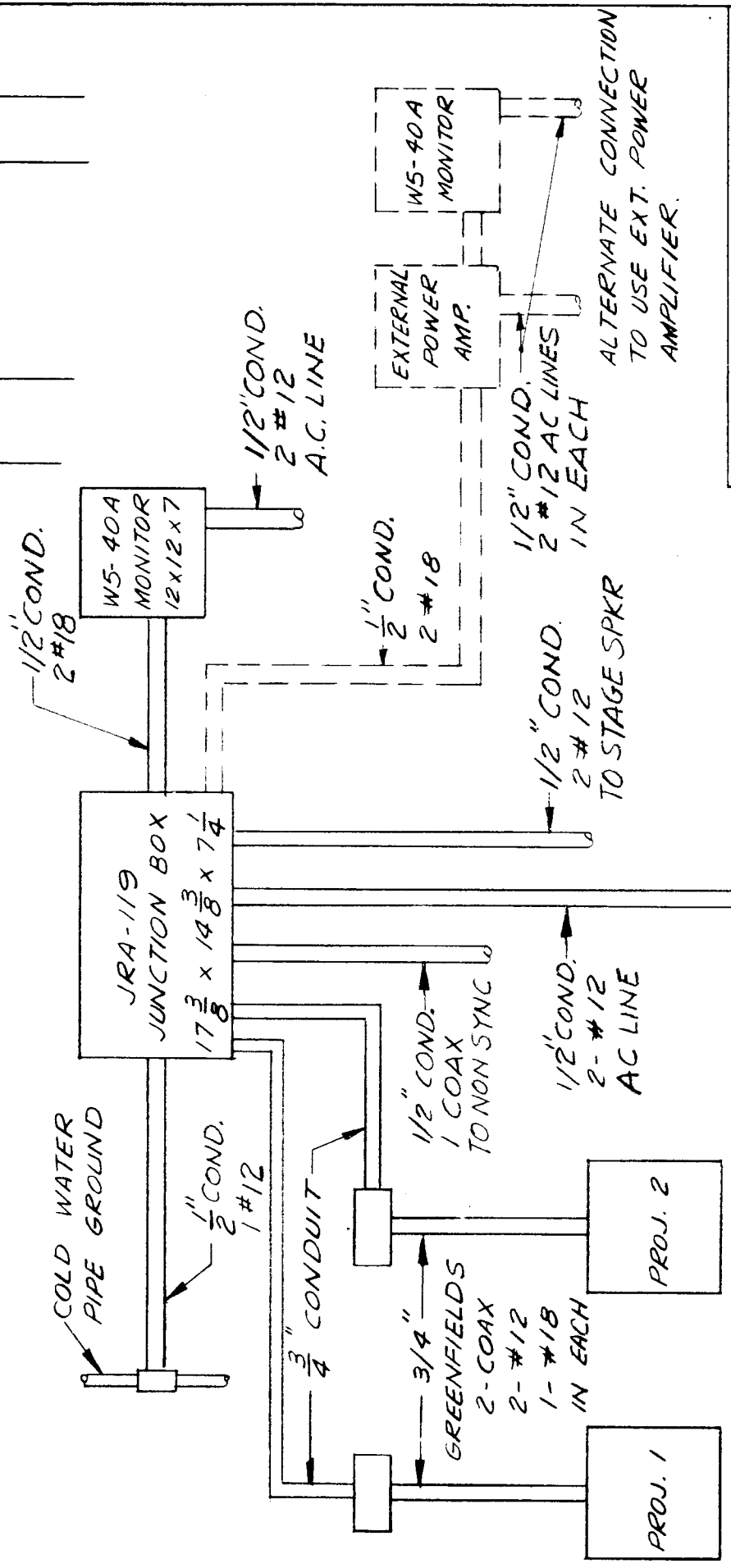
DWG NO. EL-1520-B

PART NO. JTR-O-101-2

NAME: BASIC CONDUIT LAYOUT  
INSTALLATION DIAGRAM

ISSUE LTR.	REVISIONS	APP'D	DATE
A			10-17-60
B			12-1-64

NOTE:  
COAX. IS STANDARD SHIELDED  
PLASTIC MICROPHONE CABLE



ALTERNATE CONNECTION  
TO USE EXT. POWER  
AMPLIFIER.

DWN M.A. DATE 10-17-60 CKD  
CENTURY PROJECTOR CORP.  
NEW YORK, N.Y.

DWG NO. EL-1523-D

NOTE:

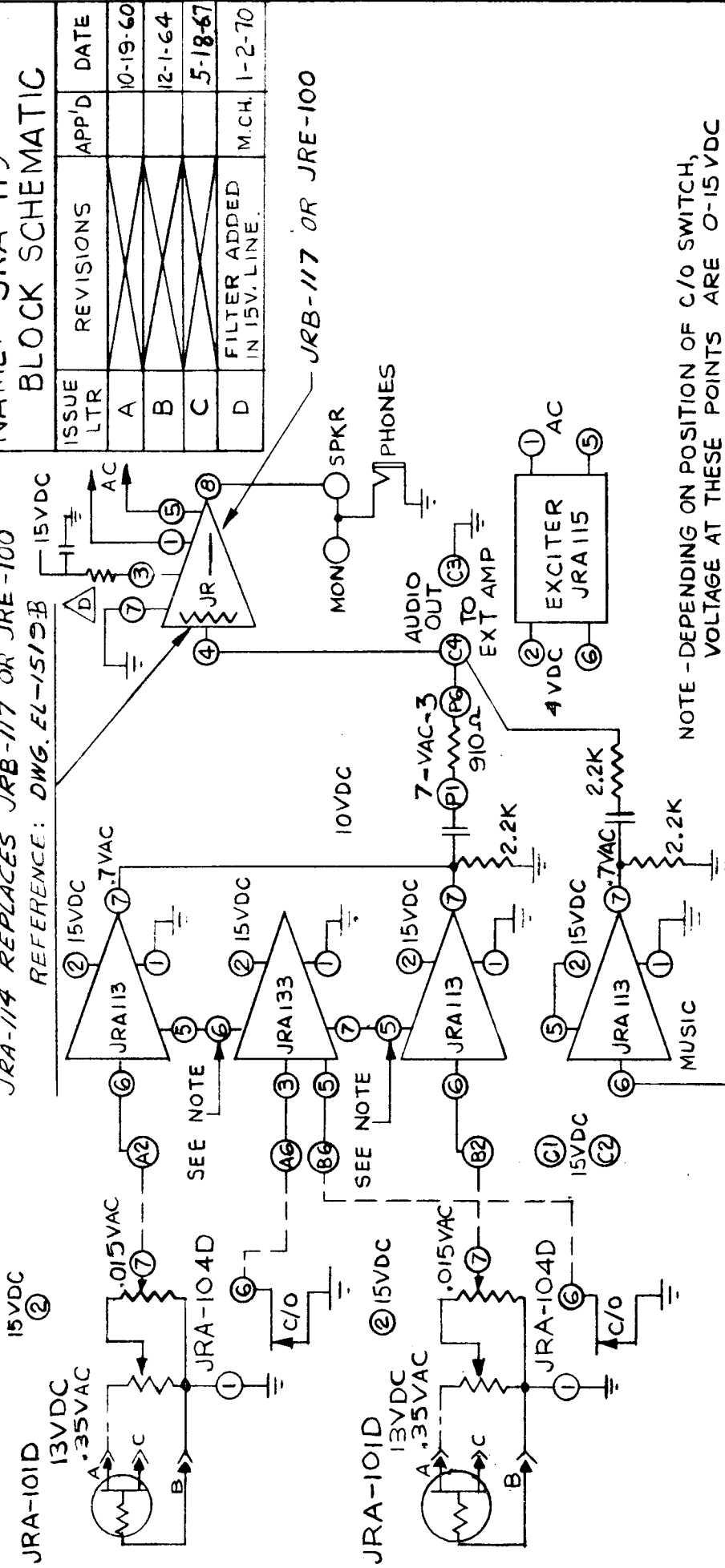
WHEN EXTERNAL POWER AMP IS USED,  
JRA-114 REPLACES JRB-117 OR JRE-100  
REFERENCE: DWG. EL-1519-B

PART NO. JTR-0-101-2

NAME: JRA-119

BLOCK SCHEMATIC

ISSUE LTR	REVISIONS	APP'D	DATE
A			10-19-60
B			12-1-64
C			5-18-67
D	FILTER ADDED IN 15V. LINE.	M.C.H.	1-2-70



JRB-117 OR JRE-100

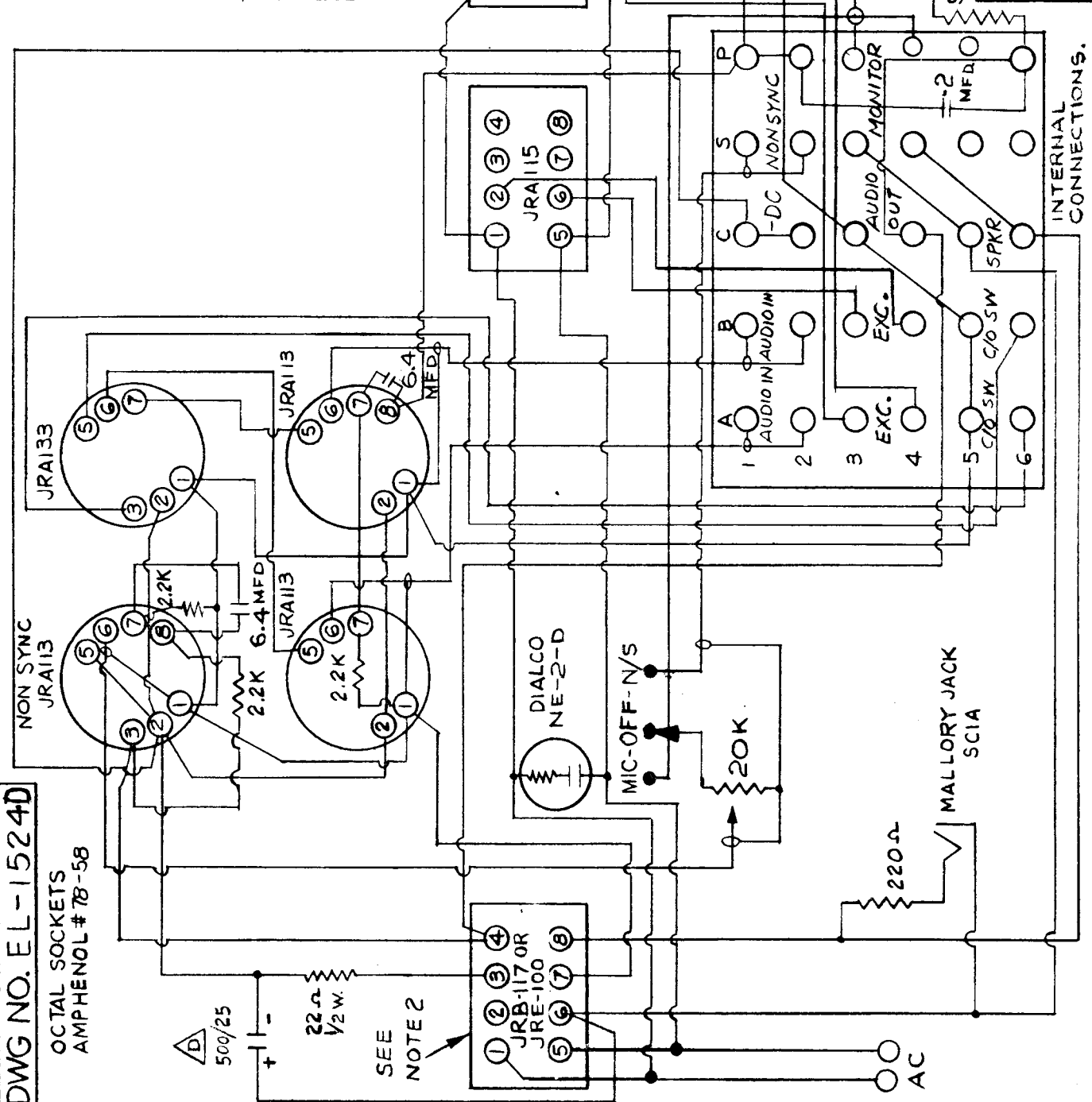
NOTE - DEPENDING ON POSITION OF C/O SWITCH,  
VOLTAGE AT THESE POINTS ARE 0-15 VDC  
AC VOLTAGES FOR NORMAL SETTING  
W/7V FROM P1 TO GROUND, AT 1HZ.  
FADER AT STEP 14.

DWN M.A. DATE 10-19-60 CKD  
CENTURY PROJECTOR CORP.  
NEW YORK, N.Y. U.S.A.

1M/3/70

PART NO.		JTR-O-101-2	
NAME		JRA-119	
WIRING DIAGRAM			
ISSUE LTR	REVISIONS	APP'D	DATE
A			11-2-60
B			12-1-64
C			5-15-67
D	FILTER ADDED	M.CH	1-2-70

RECEPTACLES  
AMPHENOL  
26-4200-85



NOTES:

1. REMOVE STRAP P<sub>1</sub>-P<sub>2</sub> TO ATTENUATE HIGH FREQ.
2. REAR VIEW FOR WIRING PURPOSES
3. WHEN EXT. POWER AMPLIFIER IS USED, JRA-114 POWER SUPPLY REPLACES JRB-117 OR JRE-100.

DWN M.A. DATE 11-2-60 CKD  
CENTURY PROJECTOR CORP.  
NEW YORK, N.Y. USA

DWG NO. EL-1524D  
OCTAL SOCKETS  
AMPHENOL # 78-58

SEE NOTE 2

1M/3/70

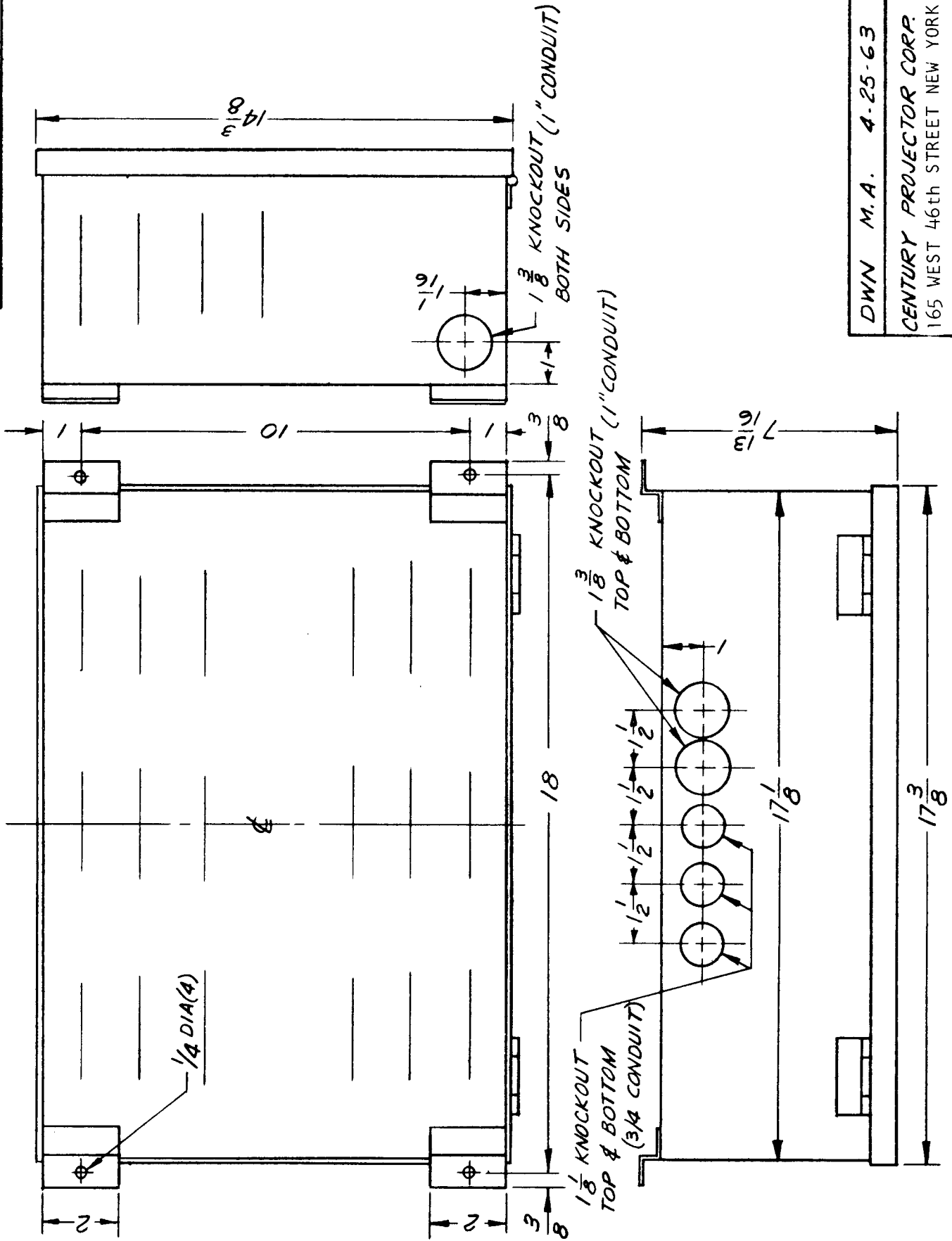
DWG NO. E-1797-B

NAME - JRA-118 & JRA-119  
JUNCTION BOX

E-1797-B

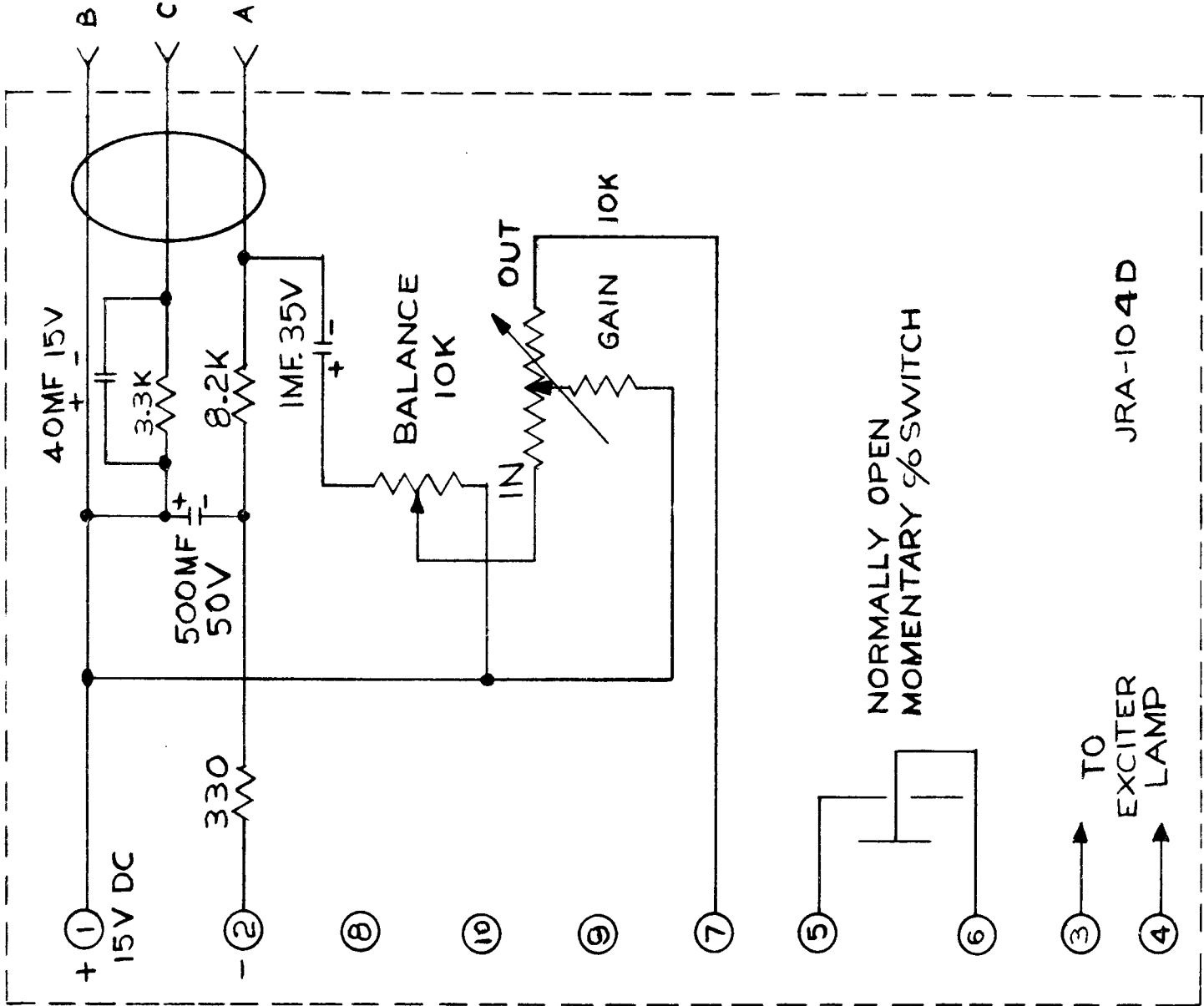
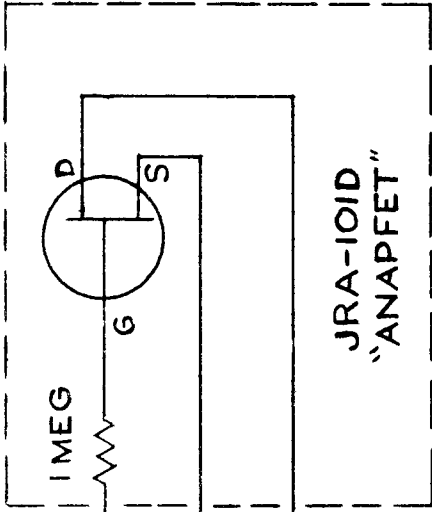
DWN M.A. 4-25-63

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165 WEST 46th STREET NEW YORK



IM 5/76





1M-6/68

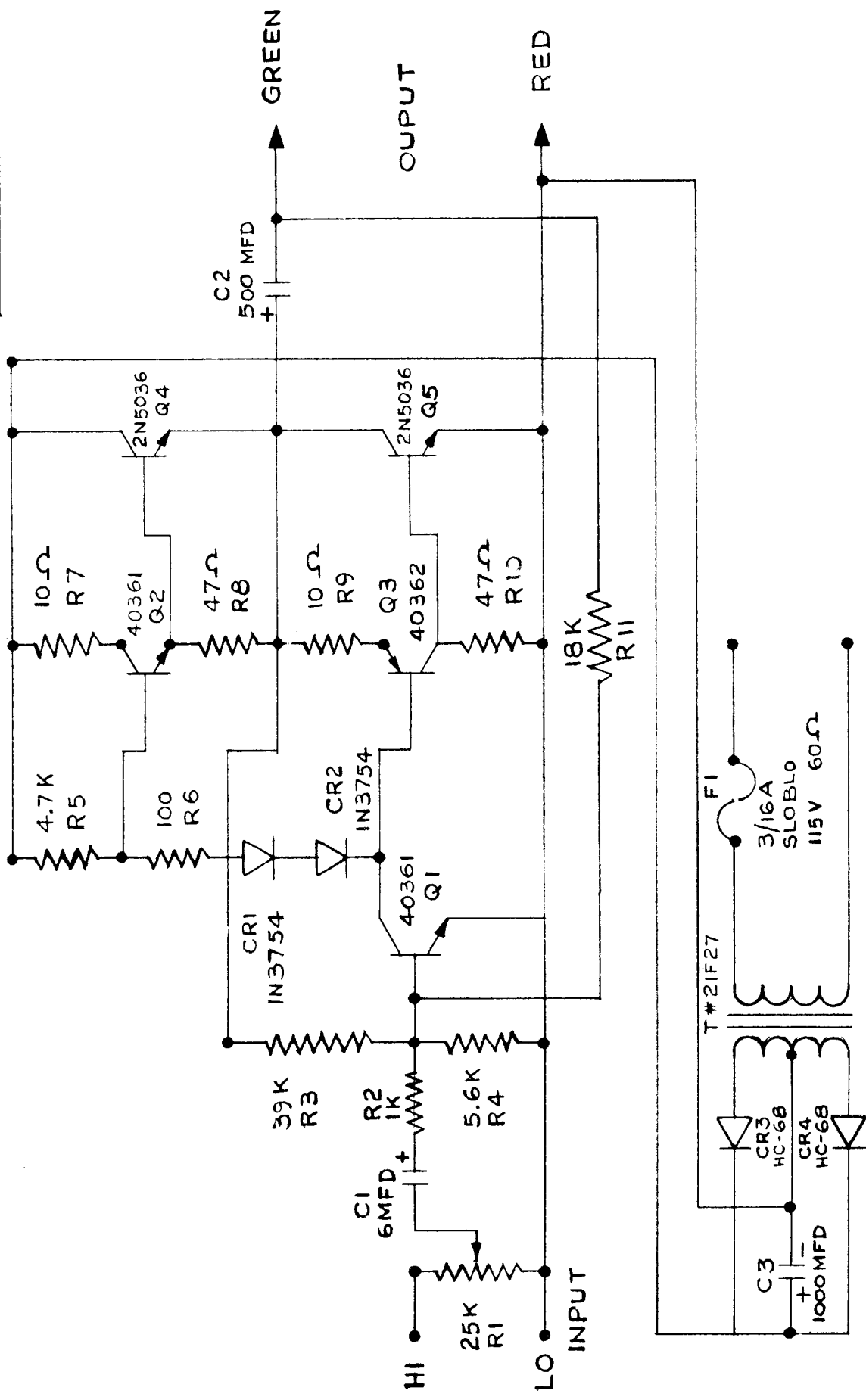
CENTURY PROJECTOR CORP. NEW YORK CITY.	
SCHEMATIC.	
MODEL OR PART NO.	DWG. NO.
JRA-101D & 104D	EL-1711

JRB-122

MONITOR AMPLIFIER  
OPTICAL SOUND SYSTEMS  
(SINGLE CHANNEL)

DWG N° E-2046

SCHEMATIC  
JRB-122



E-2046

DWN: L.O. DATE: 7-24-69CHK'D  
CENTURY PROJECTOR CORP.  
729-7TH AVE NEW YORK, N.Y.

1M-9/69